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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LOHN, JOSHUA A	

ART UNIT	PAPER NUMBER
2114	

DATE MAILED: 12/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/929,143	HARPER ET AL.	
	Examiner	Art Unit	
	Joshua A Lohn	2114	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 30 September 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-40 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-40 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 19 November 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FINAL REJECTION

Response to Arguments

Applicant's arguments filed 9/30/04 have been fully considered but they are not persuasive.

With respect to applicant's arguments that the Fulton reference fails to fully disclose applicant's invention, the examiner respectfully disagrees. On page 16 of the response, applicant argues that "Fulton does not disclose or suggest 'a method for reducing a time for a computer system to recover from a degradation of performance...'". However, Fulton does, in fact, disclose a method that reduces time spent recovering from performance degradation. Through the use of the forced recovery of the rejuvenation actions, the number of failures are reduced and any time spent in recovery from these failures is also reduced, resulting in less downtime for the system implemented by Fulton (Fulton, col. 5, lines 55-61). Applicant further argues that Fulton "does not reduce the actual duration of performing the rejuvenation (e.g., the outage duration)", however Fulton does in fact reduce the outage duration overall by avoiding the longer outages due to unplanned failures (Fulton, col. 5, lines 55-31).

With respect to applicant's arguments that Garg and Fulton in combination do not reduce the actual time to recover from a degradation of performance, as stated on page 19 of the response, the examiner respectfully disagrees. The examiner feels that a proper combination of Fulton and Garg would result in a system that uses the monitoring of Garg to detect the best time to implement the rejuvenation of Fulton, which would reduce outage time by making more efficient use of each outage period (Fulton, col. 5, lines 55-61).

With respect to applicant' arguments on page 20 that Murphy fails to make up for the deficiencies of Fulton and Garg, the examiner respectfully disagrees. The examiner feels that Fulton fully discloses the reduction of time to recovery as stated above, and that the use of Murphy is not necessary in this aspect.

In view of the above response the examiner feels that the references cited disclose a reasonable interpretation of the invention as claimed, and the rejection of the claims remains, as reiterated below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-26 and 28-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fulton, III et al., United States Patent Number 5,715,386, published February 3, 1998, in view of Garg et al., "A Methodology for Detection and Estimation of Software Aging, published November 1998.

As per claim 1, Fulton discloses a method of reducing a time for a computer system to recover from a degradation of performance in a hardware or a software in at least one first node (Fulton, col. 2, lines 11-23). Fulton further discloses monitoring the state of said at least one first node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses transferring a state of the at least one node to a second node prior to the degradation in performance of the hardware or software of the at least one first node (Fulton, col. 2, lines 11-23, where rejuvenation prevents

degradation in performance, or failure, where each node can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitoring of the state of at least one first node being used in the initiation of the state transfer.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 2, Fulton discloses the degradation of performance to be a failure (Fulton, col. 2, lines 11-23).

As per claim 3, Garg discloses predicting an outage of said hardware or said software based on monitoring, and beginning said transferring based on said predicting (Garg, page 10, left col.).

As per claim 4, Fulton discloses proactively invoking a state migration functionality to reduce said recovery time, in the form of software rejuvenation (Fulton, col. 2, lines 6-23).

As per claim 5, Fulton discloses migrating a dynamic state to stable storage of said second node, said second node being accessible to a recovering agent, to reduce an amount of time required by said recovering agent (Fulton, col. 8, lines 37-54, col. 10, lines 9-15, where the routines retrieve the dynamic state of critical memory which is logged into stable storage in nodes containing a recovery agent)

As per claim 6, Fulton discloses the computer system comprises a single node computer system, where it is assumed for the purpose of examination that the at least one first node and the second node of claim 1 are the same node (Fulton, col. 8, lines 6-8).

As per claim 7, Fulton discloses the computer system comprises a multi-node system (Fulton, col. 8, lines 8-10).

As per claim 8, Fulton discloses the second node selectively includes an application running corresponding to an application failing on said at least one first node (Fulton, col. 9, lines 11-18, col. 10, lines 9-15, where the watch daemon corresponds to an application failing of the first node).

As per claim 9, Fulton discloses connecting said at least one first node and said second node to a shared memory containing a stale state of the at least one first node and a redo log (Fulton, col., 10, lines 45-53, where the nodes are all connected and share access to the state table and all related files, including stale state and redo logs, col. 8, lines 37-54).

As per claim 10, Fulton discloses the shared memory includes a shared network (Fulton, figures 2 and 5).

As per claim 11, Fulton discloses a state transfer from said at least one first node to said second node occurs while the at least one first node is still operational (Fulton, col. 2, lines 6-23, where the purpose of rejuvenation is to avoid the failure of a node, so it is inherent that in a normal rejuvenation activity the node is operational).

As per claim 12, Garg discloses providing a failure predictor on at least one of said at least one first node and said second node (Garg, page 10, left col., where the measurements monitored predict a failure). Fulton and Garg disclose the predictor used for commanding the at least one first node to start an application if not already running (Fulton, col. 19, lines 59-66, where the addrejuv message initiates a rejuvenation application process), and commanding the second node to begin readying a state of said at least one node and redo log from the shared memory (Fulton, col. 10, lines 9-15, where the destination node will ready the stored values in the process of taking over the operation).

As per claim 13, Fulton discloses at least one node is commanded to begin mirroring its dynamic state updates to the second node as they occur, in an attempt to get the second node's state completely up to date (Fulton, col. 10, lines 9-33, where state updates are mirrored to the storage of watching nodes to keep them up to date).

As per claim 14, Garg discloses scheduling a rejuvenation to avoid an unplanned failure (Garg, page 10, left col., where the measurements that are indicated in the "Estimated time to failure" are used to avoid unplanned failures by initiating software rejuvenation).

As per claim 15, Garg discloses predicting any of an application, hardware, and operating system of said computer system as failing or undergoing a lack of performance (Garg, page 9, right col.).

As per claim 16, Fulton discloses bringing the second node's state into coincidence with the stale state of the at least one first node undergoing a lack of performance, such that the second node begins to mirror the at least one first node (Fulton, col. 10, lines 9-34, where the second node contains a log of all significant activities of the first node to allow full mirroring in the event that the first note undergoes a lack of performance, as in a crash, col. 9, lines 11-18).

As per claim 17, Fulton discloses rejuvenating the at least one first node (Fulton, col. 2, lines 11-23).

As per claim 18, Fulton and Garg disclose the rejuvenation method that includes: intentionally failing the at least one first node (Fulton, col. 2, lines 11-23) if said at least one first node is undergoing a resource exhaustion failure (Garg, page 10, left col.); and bringing the at least one first node back (Fulton, col. 19, line 46 through col. 21, line 40, where the rejuvenation process will loop periodically to fail a process and restore it to back to the executing state).

As per claim 19, Fulton discloses a computer system having at least one primary node and a secondary node (Fulton, figure 2). Fulton further discloses, commanding a secondary node to start an application if it is not already running (Fulton, col. 19, lines 59-66, where the addrejuv message initiates a rejuvenation application process), and to begin reading a state and redo log from a memory coupled to said primary node and said secondary node (Fulton, col. 10, lines 9-15, where the destination node will ready the stored values in the process of taking over the operation). Fulton discloses commanding the secondary node to apply the redo log to its state (Fulton, col. 10, lines 9-34, where the second node contains a log of all significant activities of the first node to allow full mirroring in the event that the first note undergoes a lack of

performance, as in a crash, col. 9, lines 11-18). Fulton discloses commanding the primary node to begin mirroring its dynamic state updates to the secondary node as they occur, such that the secondary node's state is brought completely up to date with said primary node; (Fulton, col. 10, lines 9-33, where state updates are mirrored to the storage of watching nodes to keep them up to date). Fulton further discloses judging whether the primary node has failed; and based on said judging, making the secondary node become the primary node (Fulton col. 9, lines 11-17, and col. 10, lines 9-15, where the monitoring node takes over as the primary for execution of the processes). Fulton fails to discloses determining whether a failure or lack of performance is imminent and acting based upon this determination.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation when failure is imminent (Garg, page 10, left col.)

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 20, Fulton discloses rebooting the primary node such that the primary node subsequently becomes the secondary node (Fulton, col. 10, lines 45-59, where a restarting node begins to act as a secondary node for monitoring processes executing elsewhere).

As per claim 21, Fulton discloses rejuvenating the primary node (Fulton, col. 2, lines 11-23).

As per claim 22, Fulton discloses that no dedicated secondary node is provided for each said at least one primary node (Fulton, col. 9, line 55 through col. 10, line 8, where the watching of nodes is adaptive based upon the current state of each and no node is dedicated secondary for any other).

As per claim 23, Fulton discloses wherein a one-to-many relationship exists between a number of said secondary node and said at least one primary node (Fulton, col. 10, lines 27-33, where multiple secondary nodes can exist to restart a failed primary process).

As per claim 24, Fulton and Garg disclose the secondary node need not be located until it is judged that a potential chance for an outage or performance degradation occurs, (Fulton, col. 19, lines 46-66, where it is shown that the implementation of rejuvenation will start the daemon that then locates a secondary node, the rejuvenation will not be implemented until the trigger measurement of Garg, page 10, left col.).

As per claim 25, Fulton discloses the secondary node is provided for a plurality of primary nodes, and, when it is determined that one primary node is about to fail, the secondary node begins mirroring a state of the failing primary node (Fulton, col. 10, lines 27-33, where the

state of a primary process can be replicated across multiple secondary nodes, allowing each secondary node to provide mirroring ability for each failing primary node, col. 9, lines 11-18).

As per claim 26, Fulton discloses migrating the state of the primary node to another node in said computer system, wherein there is other than a one-to-one relationship between the another node and the primary node (Fulton, col. 9, line 55 through col. 10, line 15, where an initial relationship between nodes is one-to-one). Fulton fails to disclose monitoring a primary node of the computer system and determining whether the primary node is failing or about to fail.

Garg discloses monitoring a primary node of said computer system and determining whether the primary node is failing or about to fail (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation, or failure. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 28, Fulton discloses a computer system having at least one primary node and a secondary node (Fulton, figure 2). Fulton further discloses, commanding a secondary node to start an application if it is not already running (Fulton, col. 19, lines 59-66, where the addrejuv message initiates a rejuvenation application process). Fulton discloses commanding the secondary node to begin replicating the state of the primary node (Fulton, col. 10, lines 9-34, where the second node contains a log of all significant activities of the first node to allow full mirroring in the event that the first note undergoes a lack of performance, as in a crash, col. 9, lines 11-18). Fulton discloses passing control to the secondary node from the primary node (Fulton col. 9, lines 11-17, and col. 10, lines 9-15, where the monitoring node takes over as the primary for execution of the processes). Fulton fails to discloses determining whether a degradation of performance is imminent and acting based upon this determination.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation when degradation of performance is imminent (Garg, page 10, left col.)

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to

allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 29, Fulton further discloses methods for the recovering of the primary node (Fulton, col. 10, lines 45-59).

As per claim 30, Fulton discloses rejuvenating the primary node (Fulton, col. 2, lines 11-23).

As per claim 31, Fulton discloses the replicating comprises reading a stale state of said primary node and a redo log from a memory coupled to said primary node and said secondary node (Fulton, col. 10, lines 9-15, where the destination node will ready the stored values in the process of taking over the operation).

As per claim 32, Fulton discloses that the primary node is operational while said secondary node is replicating the state of the primary node. (Fulton, col. 2, lines 6-23, where the purpose of rejuvenation is to avoid the failure of a node, so it is inherent that in a normal rejuvenation activity the node is operational).

As per claim 33, Fulton discloses the one secondary node is provided for a plurality of ones of primary node (Fulton, col. 10, lines 27-33, where the state of a primary process can be replicated across multiple secondary nodes, allowing each secondary node to provide mirroring ability for each failing primary node, col. 9, lines 11-18).

As per claim 34, Fulton discloses commanding the node to begin storing its state on a stable storage as part of the software rejuvenation methods (Fulton, col. 8, lines 37-54). Fulton

fails to disclose determining whether a degradation of performance of the node is imminent. Fulton also fails to explicitly disclose a more frequent rate of storage to reduce staleness of data.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation when degradation of performance is imminent (Garg, page 10, left col.)

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation. Fulton and Garg fail to explicitly state a more frequent rate of storage to reduce the staleness of data.

The theory of rejuvenation presented by Fulton discloses that the decision to rejuvenate depends primarily of the failure cost of the application and probability of failure (Fulton, col. 6, lines 53-58) and that the highest possible rate of rejuvenation should be implemented that doesn't exceed the failure cost based upon probability of failure (Fulton, col. 7, lines 1-2). The increase in rate of rejuvenation would result in an increase in the rate of storage of node states, which are a part of the rejuvenation process (Fulton, col. 8, lines 37-54 and col. 15, lines 11-24).

It would have been obvious to one skilled in the art that the theory of rejuvenation presented by Fulton, when combined with the teaching of Garg, would have combined with the inventive device of Fulton to provide a more frequent rate of storage to reduce staleness.

This would have been obvious because Garg discloses a method for indicating when a failure is imminent (Garg, page 10, left col.). The theory of rejuvenation discloses increasing the rate of rejuvenation based upon a maximum threshold of the cost of failure and the probability of failure (Fulton, col. 7, lines 1-2). It would have been obvious to one skilled in the art that if it as known that a failure is imminent the probability of the failure would be increased dramatically. The increase in probability would have resulted in greater combined cost of failure and probability of failure. This increase would have obviously resulted in one skilled in the art increasing the rejuvenation interval to match the ratio of Fulton col. 7, lines 1-5, until a time where the probability of fault is reduced. This increase in rejuvenation interval would have increased the rate of check-pointing and as a result the rate of storage would increased, reducing the staleness of the data.

As per claim 35, Fulton discloses a system for reducing a time for a computer system to recover from a degradation of performance in a hardware or a software in at least one first node (Fulton, col. 2, lines 11-23). Fulton further discloses a monitor for monitoring the state of said at least one first node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses a transfer mechanism for transferring a state of the at least one node to a second node prior to the degradation in performance of the hardware or software of the at least one first node (Fulton, col. 2, lines 11-23, where rejuvenation prevents degradation in performance, or failure, where each

node can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitor for monitoring of the state of at least one first node being used in the initiation of the state transfer.

Garg discloses a monitor for monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitor and monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 36, Fulton discloses that the computer system comprises a multi-node system, which would include at least a first node and a second node (Fulton, col. 8, lines 8-10). Fulton also discloses connecting said at least one first node and said second node to a shared memory (Fulton, col., 10, lines 45-53, where the nodes are all connected and share access to the state table and all related files). Fulton further discloses a monitor for monitoring the state of said at least one first node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses a transfer

mechanism for transferring a state of the at least one node to a second node prior to the degradation in performance of the hardware or software of the at least one first node (Fulton, col. 2, lines 11-23, where rejuvenation prevents degradation in performance, or failure, where each node can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitor for monitoring of the state of at least one first node being used in the initiation of the state transfer.

Garg discloses a monitor for monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitor and monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 37, Fulton discloses a system of reducing a degradation of performance in a computer system having a single node and a stable storage (Fulton, col. 2, lines 11-23, where the two processes execute on the single node, col. 8, lines 6-8, which includes a memory that acts as

stable storage). Fulton further discloses a monitor for monitoring the state of the node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses a transfer mechanism for transferring a state of the node to a stable storage (Fulton, col. 8, lines 37-54). Fulton fails to disclose the monitor for monitoring of the state the node being used in the initiation of the state transfer. Fulton also fails to disclose commanding the node to store its state at a more frequent rate to reduce the staleness of the state on the stable storage.

Garg discloses a monitor for monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitor and monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation. Fulton and Garg fail to explicitly state a more frequent rate of storage to reduce the staleness of data.

The theory of rejuvenation presented by Fulton discloses that the decision to rejuvenate depends primarily of the failure cost of the application and probability of failure (Fulton, col. 6, lines 53-58) and that the highest possible rate of rejuvenation should be implemented that doesn't

exceed the failure cost based upon probability of failure (Fulton, col. 7, lines 1-2). The increase in rate of rejuvenation would result in an increase in the rate of storage of node states, which are a part of the rejuvenation process (Fulton, col. 8, lines 37-54 and col. 15, lines 11-24).

It would have been obvious to one skilled in the art that the theory of rejuvenation presented by Fulton, when combined with the teaching of Garg, would have combined with the inventive device of Fulton to provide a more frequent rate of storage to reduce staleness.

This would have been obvious because Garg discloses a method for indicating when a failure is imminent (Garg, page 10, left col.). The theory of rejuvenation discloses increasing the rate of rejuvenation based upon a maximum threshold of the cost of failure and the probability of failure (Fulton, col. 7, lines 1-2). It would have been obvious to one skilled in the art that if it as known that a failure is imminent the probability of the failure would be increased dramatically. The increase in probability would have resulted in greater combined cost of failure and probability of failure. This increase would have obviously resulted in one skilled in the art increasing the rejuvenation interval to match the ratio of Fulton col. 7, lines 1-5, until a time where the probability of fault is reduced. This increase in rejuvenation interval would have increased the rate of check-pointing and as a result the rate of storage would increased, reducing the staleness of the data.

As per claim 38, Fulton discloses a signal bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus (Fulton, col. 8, lines 6-18) to perform a method of reducing a time for a computer system to recover from a degradation of performance in a hardware or a software in at least one first node (Fulton, col. 2,

lines 11-23). Fulton further discloses monitoring the state of said at least one first node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses transferring a state of the at least one node to a second node prior to the degradation in performance of the hardware or software of the at least one first node (Fulton, col. 2, lines 11-23, where rejuvenation prevents degradation in performance, or failure, where each node can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitoring of the state of at least one first node being used in the initiation of the state transfer.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

As per claim 39, Fulton discloses a signal bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus (Fulton,

col. 8, lines 6-18) to perform a method of reducing a degradation of performance in a computer system having a single node (Fulton, col. 8, lines 6-8). Fulton also discloses commanding the node to begin storing its state on a stable storage as part of the software rejuvenation methods (Fulton, col. 8, lines 37-54). Fulton fails to disclose determining whether a degradation of performance of the node is imminent. Fulton also fails to explicitly disclose a more frequent rate of storage to reduce staleness of data.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation when degradation of performance is imminent (Garg, page 10, left col.)

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation. Fulton and Garg fail to explicitly state a more frequent rate of storage to reduce the staleness of data.

The theory of rejuvenation presented by Fulton discloses that the decision to rejuvenate depends primarily of the failure cost of the application and probability of failure (Fulton, col. 6,

lines 53-58) and that the highest possible rate of rejuvenation should be implemented that doesn't exceed the failure cost based upon probability of failure (Fulton, col. 7, lines 1-2). The increase in rate of rejuvenation would result in an increase in the rate of storage of node states, which are a part of the rejuvenation process (Fulton, col. 8, lines 37-54 and col. 15, lines 11-24).

It would have been obvious to one skilled in the art that the theory of rejuvenation presented by Fulton, when combined with the teaching of Garg, would have combined with the inventive device of Fulton to provide a more frequent rate of storage to reduce staleness.

This would have been obvious because Garg discloses a method for indicating when a failure is imminent (Garg, page 10, left col.). The theory of rejuvenation discloses increasing the rate of rejuvenation based upon a maximum threshold of the cost of failure and the probability of failure (Fulton, col. 7, lines 1-2). It would have been obvious to one skilled in the art that if it as known that a failure is imminent the probability of the failure would be increased dramatically. The increase in probability would have resulted in greater combined cost of failure and probability of failure. This increase would have obviously resulted in one skilled in the art increasing the rejuvenation interval to match the ratio of Fulton col. 7, lines 1-5, until a time where the probability of fault is reduced. This increase in rejuvenation interval would have increased the rate of check-pointing and as a result the rate of storage would increased, reducing the staleness of the data.

As per claim 40, Fulton discloses a method of reducing a time for a computer system to recover from a degradation of performance in a hardware or a software in a node (Fulton, col. 2, lines 11-23). Fulton further discloses monitoring the state of the node (Fulton, col. 7, line 59

through col. 8, line 18). Fulton discloses transferring a state of the node to a stable storage and another node prior to the degradation in performance of the hardware or software of the node (Fulton, col. 2, lines 11-23, where rejuvenation prevents degradation in performance, or failure, where each node contains states in the stable storage and can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitoring of the state of the node being used in the initiation of the state transfer.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fulton, III et al., United States Patent Number 5,715,386, published February 3, 1998, in view of Garg et al., "A Methodology for Detection and Estimation of Software Aging, published November 1998, in

still further view of Murphy et al., United States Patent Application Publication Number 2003/0159084 A1, filed January 10, 2000.

As per claim 27, Fulton discloses a method of reducing a time for a computer system to recover from a degradation of performance in a hardware or a software in at least one first node (Fulton, col. 2, lines 11-23). Fulton further discloses monitoring the state of said at least one first node (Fulton, col. 7, line 59 through col. 8, line 18). Fulton discloses transferring a state of the at least one node to a second node prior to the degradation in performance of the hardware or software of the at least one first node (Fulton, col. 2, lines 11-23, where rejuvenation prevents degradation in performance, or failure, where each node can start the process of another node, col. 10, lines 9-11). Fulton fails to disclose the monitoring of the state of at least one first node being used in the initiation of the state transfer. Fulton also fails to disclose the node being a Web hosting machine.

Garg discloses monitoring a state of an important resource and using this to determine a measurement to indicate a time for software rejuvenation (Garg, page 10, left col.).

It would have been obvious to one skilled in the art at the time of the invention to use the monitoring of Garg in the invention of Fulton.

This would have been obvious because Garg indicates that the "Estimated time to exhaustion" metric would have been valuable to indicate measurements that indicate a time when a system approaching degraded mode operation. Garg further discloses that a measurement obtained from the indicated methods could help improve the fault tolerance strategies like software rejuvenation (Garg, page 10, left col.). The invention of Fulton would have obviously been improved by the inclusion of a specific value indication in the monitoring of processes to

allow for having a proactive means of preventing faults, as is desired (Fulton, col. 2, lines 6-8), that is based on analytical data and not static period of waiting for rejuvenation. Fulton and Garg fail to disclose the node being a Web hosting machine.

Murphy discloses using a node for a Web hosting machine (Murphy, page 1, paragraph 6).

It would have been obvious to one skilled in the art of the invention to include the Web hosting functionality of Murphy in the system of Fulton, modified by Garg.

This would have been obvious because the invention of Fulton discloses a system consisting of a plurality of nodes (Fulton, col. 8, lines 8-10). Fulton discusses in depth the fault tolerance of the network of nodes but does not elaborate on beneficial functions to which the network could be put. Murphy discloses using the nodes of a cluster to provide the obvious benefit of a distributed, scalable, fault tolerant, web-hosting machine (Murphy, page 1, paragraphs 6 and 7).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua A Lohn whose telephone number is (571) 272-3661. The examiner can normally be reached on M-F 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Beausoliel can be reached on (571) 272-3645. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JAL

SCOTT BADERMAN
PRIMARY EXAMINER